to another even though the parents are deprived of the tumors by an operation.

I am gratefully indebted to Professor Morgan and Doctor Bridges for helpful suggestions.

Conclusions.—1. A non-lethal tumor appeared as a mutation in the lethal tumor strain.

2. The locus of the gene of the new tumor is close to that of the dichaete in the third chromosome.

3. The tumor may occur in any segment of the larva but seems to occur more often in the twelfth and thirteenth segments.

4. The cells of the tumor are rounded or polygonal in shape and show the presence of pigment.

5. Ingrowth of tumor cells into the imaginal discs of the appendages checks the development of the parts.

6. Young tumors were inserted into larvae of normal strains. Five per cent survived the operation, completed metamorphosis and carried the inserted tumor into the adult fly.

METALLIC SALTS OF PYRROL, INDOL AND CARBAZOL

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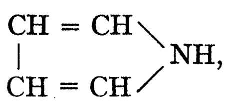
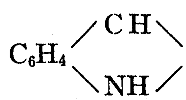
The ammono acids, that is to say, the acids of the ammonia system of acids, bases and salts,[1] are derivatives of ammonia in which one or two hydrogen atoms of the ammonia molecule are replaced by negative groups. A number of examples of compounds so related to ammonia are nitramide or nitrosyl amide, NO_2NH_2; acetamide or acetyl amide, CH_3CONH_2; phthalimide or phthalylimide, $C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle NH$; benzenesulfonnitramide or nitrosyl benzenesulfonyl imide, $C_6H_5SO_2NHNO_2$; methylnitramine or methyl nitrosyl imide; acetanilide or phenyl acetyl imide; trinitraniline, $C_6H_2(NO_2)_3NH_2$; cyanamide, $CNNH_2$; urea, $CO(NH_2)_2$ etc., etc.

These substances are true acids ranging in acidity from benzenesulfonnitramide, which approaches the ordinary mineral acids in strength, through phthalimide and methyl nitramine, which are well known to possess weak acid properties, to acetamide and urea which are not

ordinarily recognized as acids at all. The acid properties of acetamide, urea and other very weak ammono acids, however, show themselves distinctly when in solution in liquid ammonia as has been shown by the writer and his students in earlier papers.

The fact that acids too weak to be recognized as such in aqueous solution are still capable of showing acid properties when in solution in liquid ammonia is undoubtedly due to the lower solvolytic[2] action of ammonia as compared with water which in turn results from the very slight autoionization of the former solvent. To what extent liquid ammonia is dissociated has not been accurately determined. Since, however, it is a comparatively easy matter to obtain liquid ammonia with a specific conductance less than one-eighth that of water[3] it must be considerably less ionized than is the latter solvent.

It happens therefore that salts of the weaker ammono acids, which, because of the strong hydrolytic action of water are incapable of existence in the presence of this solvent, have been easily prepared from liquid ammonia solutions.

Pyrrol,  indol,  and carbazol,  are obviously derivatives of ammonia in which ammonia hydrogen is replaced by distinctly negative groups. They are therefore to be classed among the ammono acids and as such should react, in liquid ammonia solution, with the more electro positive metals and with their amides, the ammono bases, to form salts.

Experiments will be described in a paper to be printed in the *Journal of Physical Chemistry* showing that pyrrol, indol and carbazol react in liquid ammonia solution with metallic potassium, sodium, calcium and magnesium and with the amides of potassium, sodium, calcium and silver to form the following well defined salts:

Sodium pyrrol, C_4H_4NNa and $C_4H_4NNa.NH_3$.
Calcium pyrrol, $(C_4H_4N)_2Ca$ and $(C_4H_4N)_2Ca.4NH_3$.
Magnesium pyrrol, $(C_4H_4N)_2Mg.2NH_3$.
Silver pyrrol, $C_4H_4NAg.NH_3$.
Sodium indol, $C_8H_6NNa.xNH_3$.
Potassium indol, $C_8H_6NK.xNH_3$.
Calcium indol, $(C_8H_6N)_2Ca.4NH_3$.
Magnesium indol, $(C_8H_6N)_2Mg.4NH_3$.

Silver indol, $C_8H_6NAg.NH_3$.
Potassium carbazol, $C_{12}H_8NK.2NH_3$ and $C_{12}H_8NK.NH_3$.
Calcium carbazol, $(C_{12}H_8N)_2Ca.7NH_3$ and $(C_{12}H_8N)_2Ca.4NH_3$.
Silver carbazol, $C_{12}H_8NAg.2NH_3$ and $C_{12}H_8NAg.NH_3$.

[1] *Amer. Chem. J.*, **28,** 1902, (83); **47,** 1912, (285); *Eighth Int. Cong. App. Chem.* **6,** 1912, (119) and *J. Amer. Chem. Soc.*, **37,** 1915, (2279).

[2] Solvolysis is used as a general term to include hydrolysis, ammonolysis, amidolysis, aminolysis, alcoholysis, etc.

[3] Franklin and Kraus, *J. Amer. Chem. Soc.*, **27,** 1905, (191).

GROWTH AND REPRODUCTION IN FOWLS IN THE ABSENCE OF CAROTINOIDS AND THE PHYSIOLOGICAL RELATION OF YELLOW PIGMENTATION TO EGG LAYING

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The chemical identification of each of the recognized vitamines as individual substances or chemical groups is greatly to be desired. As the result of certain studies[1] which I made on the physiological relation between the yellow carotin and xanthophyll pigments of plants and the yellow lipochromes of animal tissues and fluids, I became impressed with the fact that there seemed to be more than a casual relation between the simultaneous presence of the plant carotinoids and fat-soluble vitamine in butter fat and egg yolk and in the leafy parts of green plants, and the simultaneous absence of carotinoids and fat-soluble vitamine from lard.

That phase of my carotinoid studies showing the physiological identity of egg yolk lipochrome with plant xanthophyll suggested that the fowl should be a suitable animal upon which to test the relation of plant carotinoids to growth and reproduction. It was decided to approach the question by attempting to raise a flock of chickens from hatching to maturity on a ration devoid of carotin and xanthophylls. The problem which was presented was therefore mainly one of selecting a ration devoid of yellow plant pigments but which was presumably adequate otherwise for the normal growth of chickens.

Three experiments were undertaken. The first was a preliminary experiment, during the winter of 1916–17, to test the efficacy of a ration of white corn, white corn bran, bleached flour, skim-milk and